

MS APPEAL BRIEF - PATENTS

Docket No.: 0234-0370P
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Michihisa TASAKA et al.

Application No.: 09/384,380

Confirmation No.: 7724

Filed: August 27, 1999

Art Unit: 1713

For: FIRE-RETARDANT RESIN COMPOSITION
AND MOLDED PART USING THE SAME

Examiner: R. A. Lee

APPEAL BRIEF TRANSMITTAL FORM

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an Appeal Brief on behalf of the Appellants in connection with the above-identified application.

☐ The enclosed document is being transmitted via the Certificate of Mailing provisions of 37 C.F.R. § 1.8.

A Notice of Appeal was filed on March 15, 2005.

☐ Applicant claims small entity status in accordance with 37 C.F.R. § 1.27.

The fee has been calculated as shown below:

☒ Extension of time fee pursuant to 37 C.F.R. §§ 1.17 and 1.136(a) - \$1590.

Birch, Stewart, Kolasch & Birch, LLP


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- ☒ Fee for filing an Appeal Brief - \$500.00 (large entity).
- ☒ Check(s) in the amount of \$2090 are attached.
- ☐ Please charge Deposit Account No. 02-2448 in the amount of \$2090. A triplicate copy of this sheet is attached.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: September 15, 2005

Respectfully submitted,

By 

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Attachment(s)

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APPEAL BRIEF

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Sir:

Appellants submit the following Appeal Brief in connection with the Notice of Appeal filed on March 15, 2005 in connection with the above-identified application.

(i) Real Party in Interest

The real party in interest is Riken Technos Corporation, of 3-11-15, Nihonbashi-honcho, Chuo-ku, Tokyo, Japan as evidenced by the Assignment recorded at Reel #013033; Frames #0134-0140.

(ii) Related Appeals and Interferences

There are no related appeals or interferences associated with this application.

(iii) Status of Claims

Claims 1-3, 5-7, and 10-36 are currently pending. Claims 1-3, 5-7 and 10-15 have been twice rejected in the Office Action dated December 15, 2004. Claims 16-36 were added with the Request for Continued Examination filed on June 14, 2004 and were rejected in the Office Action dated December 15, 2004 under the same grounds as claims 1-3, 5-7 and 10-15. Claims 4, 8 and 9 were previously canceled. The rejection of claims 1-3, 5-7, and 10-36 is being appealed herein.

(iv) Status of Amendments

All amendments to the claims have been entered as of the Office Action dated December 15, 2004. There are no outstanding amendments.

(v) Summary of Claimed Subject Matter

The present invention is directed to a fire-retardant resin composition, which comprises: a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) varying amounts of a nonaromatic-series softening agent for rubber, (c) varying amounts of an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, (d) varying amounts of a polypropylene resin, (e) varying amounts of an organic peroxide, and (f) varying amounts of a (meth)acrylate-series and/or allyl-series

crosslinking aid, and varying amounts of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A), wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; and the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A). The presently claimed invention is also directed to a method of preparing the fire retardant resin composition claimed, and to a molded part obtained by molding the fire retardant resin composition claimed. Embodiments of the present invention vary where the amount of the softening agent varies, the amount of the ethylene/ α -olefin copolymer varies, the amount of the polypropylene resin varies, the amount of the organic peroxide varies, the amount of the crosslinking aid varies and the amount of the metal hydrate (B) varies.

(vi) Grounds of Rejection to be Reviewed on Appeal

Claims 1-3, 5-7, and 10-36 stand rejected under 35 U.S.C. §103(a) over U.S. Patent 6,433,062 to Tasaka et al. (hereinafter Tasaka '062) in view of U.S. Patent 5,221,781 to Aida et al. (hereinafter Aida '781).

(vii) Argument

The Claims on Appeal stand or fall together.

I. Rejection under 35 U.S.C. §103(a) over Tasaka '062 in view of Aida '781.

A. No Prima Facie Case of Obviousness Exists

The Examiner has failed to establish a *prima facie* case of obviousness by failing to show that the cited references, when combined, teach or suggest all the limitations of the present invention. The Examiner has also failed to establish that one of ordinary skill in the art would be motivated to combine the cited references to arrive at the present invention.

According to *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988), a *prima facie* case of obviousness is established when the Examiner establishes that there is some evidence of an objective teaching in the cited art or in the general knowledge within the field of art that would motivate one to combine the relevant teachings in the cited references. The combination of teachings must disclose or suggest each and every element of the claimed invention. The Examiner has failed to establish such evidence in this case. The Examiner attempts to establish a *prima facie* case of obviousness in the Office Action dated December 15, 2004. The Examiner states that it would be *prima facie* obvious to one having ordinary skill in the art at the time the

invention was made to combine the composition in Tasaka '062 with the silane coupling agent of Aida '781 such that the metal hydrate ($\text{Mg}(\text{OH})_2$) of Tasaka '062 is treated with the vinyl silane coupling agent of Aida '781 to obtain the present invention. The Examiner seems to state that the motivation for making the combination is that one would desire homogenous dispersion of inorganic components in a polymer resin. No evidence to support the Examiner's statement has been provided. The Examiner merely states that one would be motivated to use coupling agents to obtain uniform dispersion. The Examiner states that the expectation that such an embodiment would work successfully is motivation. Yet, no evidence of such success or motivation has been provided by the Examiner. In fact, Appellants submit that the combination of Tasaka '062 and Aida '781 fail to disclose or suggest the presently claimed invention.

A-1. The Present Invention and Its Advantages

The present invention is directed to a fire-retardant resin composition, a molded part using the composition, and a method of preparing the fire retardant resin composition. The inventive composition and molded article have excellent characteristics, such as resistance to whitening when bent, mechanical strength (e.g. tensile strength), flexibility and abrasion resistance. The present invention is prepared by heating and kneading the specific component (A) including the claimed ingredients (a), (b), (c) and (d) together with an organic peroxide (e), a crosslinking aid (f), and a metal hydrate (B) that has been surface-treated in a specific ratio with a specific silane coupling agent having a vinyl group or an epoxy group at its terminal. This forms a chemical bond of a proper bonding strength between the resin component (A) and the metal hydrate (B). This also forms a crosslinked structure in the resin component (A). Importantly, the formation of

the chemical bond and the formation of the partial crosslinked structure is obtained by heating and kneading components (A) and (B), where component (A) includes ingredients (a) to (d) as recited in the claims in the presence of the organic peroxide (e) and the crosslinking aid (f) as recited in the claims.

As described in the first full paragraph on page 39 of the specification, it is assumed that the thermoplastic resin component (A) and the metal hydrate (B) bond to each other via the silane coupling agent having a specific terminal of a vinyl or epoxy group. In order to form this bond, it is necessary to mix components (A) and (B) before or simultaneously with the partial crosslinking reaction of the component (A). If the mixing occurs too late in the reaction, then the resulting product will not have the excellent properties of the present invention, such as improved tensile strength. This is illustrated in comparative example 9 in the Declaration of Mr. Kobayashi under 37 C.F.R. §1.132 filed on June 14, 2004. A copy of this Declaration is attached. The particular mixing as described in the present invention allows component (A) to admix with a very large amount of metal hydrate (B) without losing mechanical strength or deteriorating physical properties.

The present invention has such remarkable characteristics because of the specific thermoplastic resin components used in the presently claimed invention. The metal hydrate and the resin components are bonded to each other via the silane coupling agent. Thus, when heating and kneading the mixture of the metal hydrate and the resin components in the presence of an organic peroxide, the extrusion processability is not deteriorated even when a large amount of metal hydrate is added. Excellent mechanical properties and abrasion-resistance are achieved by the specific components. See page 39, lines 7-24 of the present specification.

A-2. Distinctions Exist Between the Present Invention and the Cited Art

Appellants submit that the specific components of the claimed composition and the specific method of making the same composition are neither disclosed nor suggested by the cited art. As will be explained below, not only are specific elements of the present claims missing from the prior art, but also, the prior art contains teachings against their combination.

The primary reference of Tasaka '062 discloses a thermoplastic elastomeric resin composition heat-crosslinked in the presence of an organic peroxide comprising (a) 100 parts by weight of a block copolymer consisting of at least two polymeric blocks (A) composed mainly of a vinyl aromatic compound and at least one polymeric block (B) composed mainly of a conjugated diene compound, and/or a hydrogenated block copolymer obtained by hydrogenating said block copolymer, (c) 5 to 150 parts by weight of polyethylene or a copolymer composed mainly of ethylene, and (d) 5 to 80 parts by weight of polypropylene or a copolymer composed mainly of propylene, characterized in the component (c) is one which has been prepared using a single site catalyst.

Tasaka '062 fails to disclose treating the metal hydrate ($\text{Mg}(\text{OH})_2$) with a silane coupling agent. Further, Tasaka '062 fails to suggest or disclose heating and kneading a resin component, a magnesium hydroxide surface-treated with a specific silane-coupling agent, an organic peroxide and a crosslinking aid, which are all present in the system at the same time. To compensate for these deficiencies the Examiner has attempted to rely on the secondary reference of Aida '781.

Aida '781 discloses a thermoplastic resin composition made up of 100 parts by weight of a thermoplastic resin containing a partially crosslinked composition, said partially crosslinked composition being prepared by dynamically heat-treating a composition consisting essentially of a material selected from the group consisting of (A) a thermoplastic resin, (B) a rubbery substance and a mixture of (A) and (B) in the presence of a crosslinking agent selected from the group consisting of (C) a dihydroaromatic compound or a polymer thereof, (D) an ether compound, (E) a tetrahydroaromatic compound and (F) a cyclopentane compound, in combination with (G) a polyfunctional unsaturated monomer; and (H) 5-200 parts by weight of a filler.

The Examiner's rejection is improper. First, Aida '781 specifically teaches away from utilizing an organic peroxide, an ingredient which is actually required by Tasaka '062. This is evidence which would lead one of skill in the art away from the combination of references as alleged by the Examiner. Second, there is no motivation to treat the metal hydrate (B) with the specific silane coupling agent at the ratio required by the present claims. In fact, there is no motivation to select the specific silane coupling agent at all from the list of agents disclosed by Aida '781. Third, similar to the deficiency of Tasaka, Aida '781 also fails to suggest or disclose heating and kneading components (A) and (B) in the presence of ingredients (e) and (f). In other words, Aida '781 contains no disclosure concerning heating and kneading a resin component, a magnesium hydroxide surface-treated with a specific silane-coupling agent, an organic peroxide and a crosslinking aid, which are all present in the system at the same time. These two specific deficiencies in the Examiner's rejection and the prior art references are discussed below:

A-3. Aida '781 Teaches Away from Using an Organic Peroxide

Aida '781 fails to suggest or disclose using an organic peroxide in the crosslinking reaction. In fact, at column 8, lines 54 to 64, Aida '781 discusses drawbacks in conventional crosslinking when using an organic peroxide. Aida '781 actually recommends using a dihydroaromatic compound, an ether compound, a tetrahydroaromatic compound, or a cyclopentane compound as the crosslinking agent together with a polyfunctional monomer. Please also see column 2, lines 17 to 57 and 65 to 68 of Aida '781. In Aida '781, at column 2, lines 17-57, Aida '781 specifically discusses the problems encountered upon causing crosslinking in various resin compositions when organic peroxides are employed. The Examiner is respectfully requested to direct his attention to this disclosure, that is column 2, lines 17-57 of Aida '781.

In this connection, Aida '781, at column 2, lines 60-68 under the heading "SUMMARY OF THE INVENTION" mentions that it is the object of the invention of Aida '781:

to provide a filler-incorporated thermoplastic resin composition remarkably superior in moldability without deterioration in mechanical strength such as tensile strength and rigidity and in heat resistance as compared with like compositions prepared by conventional simple blending method and crosslinking method using peroxide.

Thus, not only does Aida '781 lack any "positive teaching" concerning causing crosslinking in a given composition by using (or permitting use of) an organic peroxide, but, in fact, Aida '781 contains a "negative teaching" that one should avoid using any organic peroxide to cause crosslinking in the resin composition. Therefore, Aida '781 specifically teaches away from the disclosure of Tasaka '062.

Contrary to the above, the present Appellants have confirmed and demonstrated that, in the present invention, it was impossible to cause partial crosslinking in the resin composition, when no organic peroxide was used.

Further, in column 5, lines 49-50 of Aida '781, Aida discloses ethylene glycol dimethacrylate as an example of the polyfunctional monomer (G). This corresponds to the crosslinking aid (g) disclosed at column 8, line 25 of Tasaka '062. However, Aida '781 contains no description of an organic peroxide which might correspond to that of Tasaka '062; and Aida '781 certainly lacks a description concerning the combination of an organic peroxide and a crosslinking aid to cause partial crosslinking in a resin composition.

To summarize, in Aida '781, there exists a discussion of the drawbacks in conventional crosslinking methods which employ peroxides. Aida '781 thus provides a negative teaching concerning the use of an organic peroxide. Moreover, even in a negative sense, the disclosure in Aida '781 which teaches against using a peroxide as a crosslinking agent is in a totally different capacity as the use disclosed in Tasaka '062. Importantly, Aida '781 contains no positive disclosure concerning the use of an organic peroxide in the present capacity. As such, Appellants submit that one of ordinary skill in the art considering these teachings together would not be motivated to combine the teachings because the manner of causing cross-linking in the resin components is entirely different between Tasaka '062 and Aida '781, particularly in the role of peroxide and the crosslinking aids used.

Thus, Appellants respectfully submit that no *prima facie* case of obviousness has been presented since there is no motivation to combine the references.

A-4. The Cited Art Teach Away from the Present Requirement for Treatment of the Metal Hydrate (B) with a Specific Silane Coupling Agent at a Specific Ratio.

Appellants also submit that even if all the elements of the claimed invention were present between the cited references, a point not conceded, there is no clear motivation to combine Tasaka '062 and Aida '781 to arrive at the present invention. Neither Tasaka '062 nor Aida '781 suggest modifying the composition and method of making the composition as taught in Tasaka '062 with the teachings in Aida '781 to treat the metal hydrate with a specific silane coupling agent. In fact, the teachings in Tasaka '062 and the teachings in Aida '781 both teach away from the present invention.

In the present invention, the metal hydrate (B) treated by a specific silane coupling agent at a specific ratio according to the amount of the hydrate, which is present in an amount of not only 50 parts by weight or more, but less than 100 parts by weight, but also 100 parts by weight or over up to 300 parts by weight.

On the other hand, component (e) in Tasaka '062 is an inorganic filler, such as magnesium hydroxide. Yet, Tasaka '062 discloses at column 7, lines 46 to 50 that if the amount of the component (e) exceeds 100 parts by weight, the mechanical strength of the elastomer composition obtained is very low and its hardness is so high that its flexibility is lost and the moldability of the composition is deteriorated. Tasaka '062 fails to suggest or even hint at treating component (e) to improve dispersibility.

A-5. There is No Motivation to Select the Specific Silane Coupling Agent of the Present Claims.

Appellants also submit that no motivation exists to select the specific silane coupling agent from the laundry list of agents disclosed in Aida '781. Pursuant to MPEP § 2143.01, there

must be some objective teaching in the reference or in the general knowledge in the art to select the specific surface treatment agent so as to arrive at the present invention. There are no indications that the specific silane coupling agent is preferred for treating the metal hydrate, e.g., magnesium hydroxide.

At best, the Examiner has pointed out a combination of references that make it “obvious to try” the claimed invention. “Obvious to try” is not the standard under which claims should be rejected under 35 U.S.C. 103. See *In re Dow Chemical Co.*, 5 USPQ2d 1521, 1532 (Fed. Cir. 1988) (rejecting the “obvious to try” standard).

If one were to try to combine the references to obtain the present invention, it would be an impermissible hindsight reconstruction. Also, the combination suggests combining components of the resin composition that are discouraged in the secondary reference of Aida ‘781.

Further, as discussed above, the present invention is prepared by heating and kneading the specific component (A) including the claimed ingredients (a), (b), (c) and (d) together with an organic peroxide (e), a crosslinking aid (f), and a metal hydrate (B) that has been surface-treated in a specific ratio with a specific silane coupling agent having a vinyl group or an epoxy group at its terminal. However, these specific requirements, for instance, as required by claim 1, are absent from the Tasaka ‘062 and Aida ‘781 references. This represents an additional distinction between the present claims and the cited art.

For all of the above reasons, Appellants respectfully submit that there exists no *prima facie* case of obviousness. However, even if there exists a hypothetical *prima facie* case of

obviousness, a point not conceded by Appellants, the present invention achieves unexpectedly superior results, which rebut any hypothetical *prima facie* case of obviousness.

B. Secondary Indicia of Non-obviousness Exist

Appellants submit that the present invention possesses unexpected superior properties over the cited art. The present invention has excellent resistance to whitening, excellent mechanical strength, excellent flexibility and excellent abrasion resistance. This is obtained by using a specific composition of component (A) having ingredients (a) to (d); the organic peroxide (e); the crosslinking aid (f); and the metal hydrate (B), which has been pretreated in a specific ratio with a silane coupling agent having a vinyl or epoxy group at its terminal, where each component is in a specific amount. Please see the Declaration under 37 C.F.R. §1.132 of Mr. Kobayashi submitted on June 14, 2004 to further explain the superior properties and unexpected results of the present invention.

Concerning the “whitening” properties, Appellants point out that the resistance to whitening (or the suppression of whitening) is an important property for products produced from the present fire-retardant resin compositions. The resistance to, or suppression of whitening is not simply an aesthetic property. That is, if whitening is observed in a product, this can be taken as an indication of a defective product. However, suppression of such whitening can help to prevent any complaints concerning allegedly defective products.

In the Declaration, Mr. Kobayashi explains the examples in the specification, specifically Example 1, which represents the invention and Comparative Examples 1 and 9. The examples were prepared according to page 2 of the Declaration. Please note that component (B), magnesium hydroxide, whose surface had been treated with a vinyl silane (B-1) was used with

Example 1 and Comparative Example 9 and magnesium hydroxide whose surface had been treated with an aliphatic acid (B-2) was used for Comparative Example 1. Please see Table B in the Declaration at page 6. Please also note that component (B) was added later in the reaction in Comparative Example 9 as compared to Example 1 and Comparative Example 1. Please see Table B for a comparison of specific properties. Note that Example 1 has far superior properties as compared to Comparative Examples 1 and 9.

A review of these results reveals that the superior properties exhibited by Example 1 (the present invention) are obtained by heating and kneading components (A) and (B), before or simultaneously with the partial crosslinking reaction of component (A) in the presence of the organic peroxide (e).

In addition to the above, please also see Example 10, which contains the metal hydrate (B) in a relative amount of 163 parts by weight of 100 parts by weight of the thermoplastic resin composition and more than half the amount of the metal hydrate (B) was made up of $\text{Mg}(\text{OH})_2$ pretreated with a silane coupling agent having a vinyl group at its terminal. Comparative Example 101 contained the same amount of metal hydrate component (B), however less than half the amount of the metal hydrate was made up of $\text{Mg}(\text{OH})_2$ pretreated with such a silane coupling agent. Please see Table B of the Declaration for the test results.

In summary, in every test for each of the examples, the present invention having all the metal hydrate $\text{Mg}(\text{OH})_2$ or a specific ratio as defined in the claims that was pretreated by a specific silane coupling agent having a vinyl group or an epoxy group at its terminal had far superior properties. As such, Appellants submit that even if a *prima facie* case of obviousness

has been established, Appellants overcome it with the Declaration under 37 C.F.R. §1.132 attesting to unexpected superior results of the present invention compared to the cited art.

C. Conclusion

Appellants submit that the rejection over claims 1-3, 5-7 and 10-36 should be reversed because no *prima facie* case of obviousness has been established by the Examiner for the following reasons: (1) the Examiner has failed to establish that the combination of Tasaka '062 and Aida '781 disclose each and every element of the present invention; (2) the Examiner has failed to provide evidence of a clear motivation to combine Tasaka '062 and Aida '781 to arrive at the present invention; (3) there are inconsistent elements between Tasaka '062 and Aida '781 that teach against combining the two references; (4) there is no motivation to pick the silane coupling agent of the present invention from the laundry list of agents disclosed in Aida '781; and (5) the standard of "obvious to try" does not rise to the level of *prima facie* obviousness.

Moreover, the rejection should be reversed because Appellants have provided evidence of non-obviousness by presenting comparative test data demonstrating that the present invention yields unexpected superior properties compared to the cited art of Tasaka '062 and Aida '781.


Application No.: 09/384,380

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Respectfully submitted,

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Attachments: Appendices (viii-x)

(viii) Claims Appendix

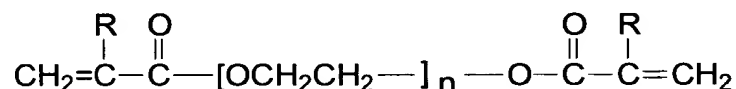
1. (Previously Presented) A fire-retardant resin composition, which comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of a nonaromatic-series softening agent for rubber, (c) 30 to 400 parts by weight of an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) 0 to 200 parts by weight of a polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of an organic peroxide, (f) 0.03 to 1.8 parts by weight of a (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A), wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; and

the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A).

2. (Original) The fire-retardant resin composition as claimed in claim 1, wherein the crosslinking aid (f) is a (meth)acrylate-series crosslinking aid represented by the formula:



wherein R represents H or CH₃, and n is an integer of 1 to 9.

3. (Original) The fire-retardant resin composition as claimed in claim 1, wherein the metal hydrate (B) is magnesium hydroxide.

4. (Canceled).

5. (Previously Presented) A fire-retardant resin composition, which comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of a nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of an ethylene/α-olefin

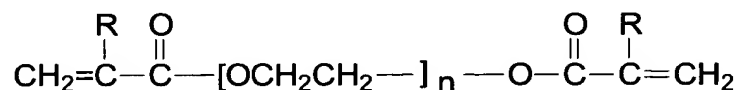
copolymer synthesized in the presence of a single site catalyst, and (d) 0 to 100 parts by weight of a polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of an organic peroxide, (f) 0.03 to 1.8 parts by weight of a (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; and

the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A).

6. (Original) The fire-retardant resin composition as claimed in claim 5, wherein the crosslinking aid (f) is a (meth)acrylate-series crosslinking aid represented by the formula:



wherein R represents H or CH₃, and n is an integer of 1 to 9.

7. (Original) The fire-retardant resin composition as claimed in claim 5, wherein the metal hydrate (B) is magnesium hydroxide.

8. (Canceled).

9. (Canceled).

10. (Previously Presented) A molded part, which is obtained by molding a fire-retardant resin composition,

wherein the fire-retardant resin composition comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of a nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) 0 to 100 parts by weight of a polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of an organic peroxide, (f) 0.03 to 1.8 parts by weight of a (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent; and

the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A).

11. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises heating and kneading, simultaneously, at the temperature equal to or higher than the melting temperature of the following thermoplastic resin component (A), (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst,

(d) a polypropylene resin, (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 30 to 400 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 200 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A);

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

12. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises heating and kneading, simultaneously, at the temperature equal to or higher than the melting temperature of the following thermoplastic resin component (A), (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, (d) a polypropylene resin, (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 100 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

13. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises:

a first step of heating and kneading (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) a polypropylene resin, to obtain a thermoplastic resin component (A), and

a second step of heating and kneading, at the temperature equal to or higher than the melting temperature of the thermoplastic resin component (A), the resultant resin component (A), (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 30 to 400 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 200 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

14. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises:

a first step of heating and kneading (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component

and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) a polypropylene resin, to obtain a thermoplastic resin component (A), and

a second step of heating and kneading, at the temperature equal to or higher than the melting temperature of the thermoplastic resin component (A), the resultant resin component (A), (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 100 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of

the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

15. (Previously Presented) A fire-retardant resin composition, which comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 30 to 70 parts by weight of a nonaromatic-series softening agent for rubber, (c) 10 to 60 parts by weight of a polypropylene-series resin, (d) 50 to 200 parts by weight of an ethylene/ α -olefin copolymer having a density of 0.91g/cm^3 or less that is synthesized in the presence of a single site catalyst, and (e) 0.1 to 1.5 parts by weight of an organic peroxide; and 100 to 250 parts by weight of a metal hydrate (B), to 100 parts by weight of the thermoplastic resin composition (A).

16. (Previously Presented) A fire-retardant resin composition, which comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated

diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of a nonaromatic-series softening agent for rubber, (c) 30 to 400 parts by weight of an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) 0 to 200 parts by weight of a polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of an organic peroxide, (f) 0.03 to 1.8 parts by weight of a (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; and

the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A) and wherein after the heating and kneading the thermoplastic resin component (A) is partially crosslinked.

17. (Previously Presented) The fire-retardant resin composition of claim 16, wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

18. (Previously Presented) A fire-retardant resin composition, which comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of a nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) 0 to 100 parts by weight of a polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of an organic peroxide, (f) 0.03 to 1.8 parts by weight of a (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less,

at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal; and

the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A) and wherein after the heating and kneading the thermoplastic resin component (A) is partially crosslinked.

19. (Previously Presented) The fire-retardant resin composition of claim 18, wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

20. (Previously Presented) A molded part, which is obtained by molding a fire-retardant resin composition,

wherein the fire-retardant resin composition comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of a nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of an ethylene/ α -olefin

copolymer synthesized in the presence of a single site catalyst, and (d) 0 to 100 parts by weight of a polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of an organic peroxide, (f) 0.03 to 1.8 parts by weight of a (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of a metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A), wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent; and

the fire-retardant resin composition is a mixture of the above formulation that is heated and kneaded at a temperature equal to or higher than the melting temperature of the thermoplastic resin component (A) and wherein after the heating and kneading the thermoplastic resin component (A) is partially crosslinked.

21. (Previously Presented) The molded part of claim 20 wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

22. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises heating and kneading, simultaneously, at the temperature equal to or higher than the melting temperature of the following thermoplastic resin component (A) after which component (A) is partially crosslinked, (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, (d) a polypropylene resin, (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 30 to 400 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 200 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A);

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

23. (Previously Presented) The method of claim 22, wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

24. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises heating and kneading, simultaneously, at the temperature equal to or higher than the melting temperature of the following thermoplastic resin component (A) after which component (A) is partially crosslinked, (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, (d) a polypropylene resin, (e) an

organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 100 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

25. (Previously Presented) The method of claim 24, wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

26. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises:

a first step of heating and kneading (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) a polypropylene resin, to obtain a thermoplastic resin component (A), and

a second step of heating and kneading, at the temperature equal to or higher than the melting temperature of the thermoplastic resin component (A), the resultant resin component (A), (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking, after said heating and kneading component (A) is partially crosslinked,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated

diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 30 to 400 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 200 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

27. (Previously Presented) The method of claim 26, wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

28. (Previously Presented) A method for preparing a fire-retardant resin composition, which comprises:

a first step of heating and kneading (a) a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) a nonaromatic-series softening agent for rubber, (c) an ethylene/ α -olefin copolymer synthesized in the presence of a single site catalyst, and (d) a polypropylene resin, to obtain a thermoplastic resin component (A), and

a second step of heating and kneading, at the temperature equal to or higher than the melting temperature of the thermoplastic resin component (A), the resultant resin component (A), (e) an organic peroxide, (f) a (meth)acrylate-series and/or allyl-series crosslinking aid, and a metal hydrate (B), to carry out crosslinking, after said heating and kneading component (A) is partially crosslinked,

wherein the fire-retardant resin composition comprises:

the thermoplastic resin component (A) comprising (a) 100 parts by weight of the block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or the hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 10 to 100 parts by weight of the nonaromatic-series softening agent for rubber, (c) 50 to 250 parts by weight of the ethylene/ α -olefin copolymer, and (d) 0 to 100 parts by weight of the polypropylene resin; and

(e) 0.01 to 0.6 parts by weight of the organic peroxide, (f) 0.03 to 1.8 parts by weight of the (meth)acrylate-series and/or allyl-series crosslinking aid, and 50 to 300 parts by weight of the metal hydrate (B), respectively to 100 parts by weight of the thermoplastic resin component (A),

wherein the metal hydrate (B) is such that (i) when the metal hydrate (B) is in an amount of 50 parts by weight or more but less than 100 parts by weight, 50 parts by weight or more of the metal hydrate (B) to 100 parts by weight of the thermoplastic resin component (A) is made up of a metal hydrate pretreated with a silane coupling agent; or (ii) when the metal hydrate (B) is in an amount of 100 parts by weight or more but 300 parts by weight or less, at least half of the amount of the metal hydrate (B) is made up of a metal hydrate pretreated with a silane coupling agent.

29. (Previously Presented) The method of claim 28, wherein the degree of partial crosslinking of component (A) after heating and kneading is 30 to 45% by weight, in terms of gel fraction.

30. (Previously Presented) A fire-retardant resin composition, which comprises:

a thermoplastic resin component (A) comprising (a) 100 parts by weight of a block copolymer made up of at least two polymer blocks A mainly made of a vinyl aromatic compound as its constitutional component and at least one polymer block B mainly made of a conjugated diene compound as its constitutional component, and/or a hydrogenated block copolymer obtained by hydrogenating the block copolymer, (b) 30 to 70 parts by weight of a nonaromatic-series softening agent for rubber, (c) 10 to 60 parts by weight of a polypropylene-series resin, (d)

50 to 200 parts by weight of an ethylene/ α -olefin copolymer having a density of 0.91g/cm^3 or less that is synthesized in the presence of a single site catalyst, and (e) 0.1 to 1.5 parts by weight of an organic peroxide; and 100 to 250 parts by weight of a metal hydrate (B), to 100 parts by weight of the thermoplastic resin composition (A) and the thermoplastic resin component (A) is partially crosslinked.

31. (Previously Presented) The fire-retardant resin composition of claim 30, wherein the degree of partial crosslinking of component (A) is 30 to 45% by weight, in terms of gel fraction.

32. (Previously Presented) The molded part of claim 10, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal.

33. (Previously Presented) The method of claim 11, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal.

34. (Previously Presented) The method of claim 12, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal.

35. (Previously Presented) The method of claim 13, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal.

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36. (Previously Presented) The method of claim 14, wherein the silane coupling agent is a silane compound having a vinyl group or an epoxy group at its terminal.

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ix. Evidence Appendix

A Declaration under 37 C.F.R. § 1.132 is attached. This Declaration was submitted on June 14, 2004.

Application No.: 09/384,380

Docket No.: 0234-0370P

x. Related Proceedings Appendix

(Not applicable).

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Michihisa TASAKA et al.

Application No.: 09/384,380

Group Art Unit: 1713

Filed: August 27, 1999

Examiner: Rip A. Lee

Confirmation No.: 7724

For: FIRE-RETARDANT RESIN COMPOSITION AND MOLDED PART USING THE
SAME

DECLARATION UNDER 37 C.F.R. § 1.132

Honorable Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

I, Kazuhiko KOBAYASHI, declare and state that:

1. I am a Japanese citizen residing at 3-26-7, Sugita,
Isogo-ku, Yokohama-shi, Kanagawa-ken, Japan.

I was graduated from Science & Engineering Section, CHUO
University in March 1982.

I have been employed by RIKEN VINYL INDUSTRY CO., LTD. (whose
name is changed to RIKEN TECHNOS CORPORATION as of October 1, 2001)
since April 1982. I engaged in research and development of
insulating-materials for electric wires at Compound Technical
Department of the said company since April 1985. Further, I have
been engaged in research and development of insulating-materials
for electric wires in Polymer Application R&D Department at
Material Research Center of the said company since April 1998.

I am intimately familiar with the contents of United States

Patent Application No. 09/384,380, filed on August 27, 1999, its prosecution before the United States Patent & Trademark Office, and the references cited therein.

2. I have studied the contents of the cited Tasaka et al.'s U.S. Patent No. 6,433,062, and Aida et al.'s U.S. Patent No. 5,221,781.

3. To show the superiority of the present invention, the following tests were conducted, by me or under my supervision:

Test

As described in the EXAMPLES section (from line 4 on page 53, to page 72) of the present specification, the resin compositions, sheets of said compositions, and insulated wires having insulating coverings of said compositions of Example 1 and Comparative Examples 1 and 9, respectively, were prepared.

That is, use was made of, as the ingredient (a), a hydrogenated styrene/ethylene/propylene/styrene copolymer (SEPS); as the ingredient (b), a paraffin oil; as the ingredient (c), an ethylene/1-octene copolymer having a density of 0.87 g/cm^3 (c-1); as the ingredient (d), a polypropylene (MFR: 8g/10 min) (d-1) or (d-2), as shown in the following Table B; as the ingredient (e), 2,5-dimethyl-2,5-di(t-butylperoxy)-hexane; as the ingredient (f), triethylene glycol dimethacrylate; and as the component (B), magnesium hydroxide whose surface had been treated with a vinyl silane (B-1) for Example 1 and Comparative example 9, or magnesium hydroxide whose surface had been treated with an

aliphatic acid (B-2) for Comparative Example 1, as shown in Table B, to prepare the compositions, respectively.

In both Example 1 and Comparative Example 1, all of the components were dryblended at room temperature, heated and kneaded in a Banbury mixer at 200 °C, and then discharged at the discharge temperature of 200 °C, to obtain the fire-retardant resin compositions. In Comparative Example 9, after all the components except the metal hydrate (B) were heated and kneaded at 200 °C in a Banbury mixer, the metal hydrate (B) was added, followed by kneading and discharging, to obtain the fire-retardant resin composition. The temperature 200 °C at which the components were heated and kneaded in a Banbury mixer was equal to or higher than the melting temperature of the thermoplastic resin component (A).

The compounds that were used, as shown in Table B, were described in detail in from line 4 on page 61, to the last line on page 64, in particular, the compounds for (B) Metal hydrate are listed again as follows:

(B-1) for Example 1 and Comparative Example 9

Manufacturing company: Kyowa Chemical Co., Ltd.

Trade name: Kisma 5LH

Type: magnesium hydroxide surface-treated with a
silane coupling agent having a vinyl group at
the terminal; and

(B-2) for Comparative Example 1

Manufacturing company: Kyowa Chemical Co., Ltd.

Trade name: Kisma 5B

Type: magnesium hydroxide treated with an aliphatic
acid

This metal hydrate, Kisma 5B (trade name), $Mg(OH)_2$ all of which was pretreated with an aliphatic acid, is the same one utilized in Examples 15, 16, 17, 18, 20, 21 and 22 of Aida et al.'s U.S. Patent No. 5,221,781 (hereinafter referred to Aida '781). Please see lines 33 to 36 in column 12, and Table 2 in columns 13 to 16 of Aida '781.

From the thus-obtained resin compositions of Example 1 and Comparative Examples 1 and 9, 1-mm-thick sheets were formed, respectively, as described in lines 11 to 13 on page 55 of the present specification.

In addition, from the resin compositions of Example 1 and Comparative Examples 1 and 9, insulated wires were prepared, respectively, as described in lines 14 to 22 on page 55 of the present specification.

As to the thus-obtained sheets, the tensile properties (extension (elongation) (%) and tensile strength (MPa)) and the heat deformation property were tested and evaluated in the same manner as described in lines 19 to 24 on page 56 of the present specification. The results are shown in Table B.

As to the thus-obtained insulated wires, the tensile properties, the abrasion resistance, the horizontal flame test,

the 60°-inclined flame test, the heat deformation rate test, the whitening test (if a whitening phenomenon was observed when bent), the extrudability test, and the flexibility test were carried out, to test and evaluate the covering layers of each insulated wire in the same manner as described in from line 4 on page 57, to line 3 on page 61 of the present specification. The results are also shown in Table B.

Further, for reference, the resin compositions and results exhibited by the sheets and wires prepared from the compositions, shown in Table A in the Declaration Under 37 C.F.R. § 1.132 dated April 18, 2003, were excerpted and are again shown in Table B below (Comparative example 101 and Example 10). Example 10 contained the metal hydrate (B) (i.e. B-1 and B-2) in a relative amount of 163 parts by weight to 100 parts by weight of the thermoplastic resin component (A) (i.e., {a + b+ c-1 +(d-1 or d-2)}), and more than half the amount of the metal hydrate (B) was made up of Mg(OH)₂ pretreated with a silane coupling agent having a vinyl group at its terminal (B-1). Comparative example 101 contained the same amount of the metal hydrate (B). However, in Comparative example 101, less than half the amount of the metal hydrate (B) was made up of Mg(OH)₂ pretreated with such a silane coupling agent (B-1).

Table B

		Compara -tive Example 1	Compara -tive Example 9	Example 1	Compara -tive example 101	Example 10
a	SEPS	100	100	100	100	100
b	Paraffin oil	40	40	40	40	40
c-1	Ethylene/ α -olefin copolymer (ethylene/1-octene copolymer synthesized using single site catalyst) (Density, 0.870)	133	133	133	133	133
d-1	Block polypropylene	-	-	33	-	-
d-2	Random polypropylene	33	33	-	33	33
e	Organic peroxide	0.66	0.66	0.66	0.66	0.66
f	Crosslinking aid	2	2	2	2	2
	Maleic acid-modified LLDPE	27	27	27	27	27
B-1	Kisma 5LH (Mg(OH) ₂ treated with vinyl silane)	-	500 (163)*.*1	500 (163)*	200	300
B-2	Kisma 5B (Mg(OH) ₂ treated with aliphatic acid)	500 (163)*	-	-	300	200
	Antioxidant	3	3	3	3	3
	Lubricant	6	6	6	6	6
Tests of the sheet	Extension (%)	520	320	200	460	390
	Tensile strength (MPa)	× 6	× 7	○ 19	× 9.0	○ 12
	Heat deformation at 121 °C (%)	20	20	13	13	13
Tests of the insulated (electric) wire	Extension (%)	530	170	220	430	390
	Tensile strength (MPa)	× 6	× 7	○ 20	× 9.3	○ 12
	Horizontal flame test	10/10	10/10	10/10	10/10	10/10
	60°-inclined flame test	10/10	10/10	10/10	10/10	10/10
	Abrasion resistance	△	○	○	○	○
	Whitening	×	○	○	×	○
	Heat deformation (%)	35	32	21	22	21
	Extrudability	○	○	○	○	○
	Flexibility	○	○	○	○	○

Note 1: Each amount of ingredients in the composition is expressed in "parts by weight"

Note 2: "-" means not added

Note 3: * A numerical value in a bracket shows in a relative amount of Component (B) to 100 parts by weight of the thermoplastic resin Component (A), i.e. {a + b + c-1 + (d-1 or d-2)}.

Note 4: *1 Component (B) was added after heating and kneading at 200 °C the components and ingredients except Component (B).

Note 5: Criteria of evaluation for the properties shown in Table B.

For sheets:

Extension; A value of 100% or more is required to pass the test;

Tensile strength;

10 MPa or more: Good (designated by "O"),

Less than 10 MPa: Not good (designated by "x");

Heat deformation; A value of 30% or less is required to pass the test.

For insulated wires:

Extension; A value of 100% or more is required to pass the test;

Tensile strength;

10 MPa or more: Good (designated by "O"),

Less than 10 MPa: Not good (designated by "x");

Abrasion resistance; The number of movements of the blade was 1000 or more (designated by "O") or 500 or more but less than 1000 (designated by "x"), until in contact with the conductor, each of which passed the test;

Whitening;

No whitening occurrence after winding 6 times: Good (designated by "O"),

Whitening occurrence 6 times or more after winding 6 times: Practically undesirable (designated by "x");

Heat deformation; A value of less than 50% is required to pass the test;

Extrudability;

With a normal load, there is provided an extruded wire-like product having good outer appearance: Acceptable (designated by "O");

Flexibility;

The length of the end lowered from the original level was 3 cm or more: Good (designated "O").

In the results of the horizontal flame test, the numbers of samples that passed the test (per 10 trials) are shown; and in the results of the 60°-inclined flame test, the numbers of samples that passed the test (per 10 trials) are shown.

As is apparent from the results shown in Table B, the sheets prepared from the compositions of Examples 1 and 10 according to the present invention exhibited unexpectedly superior results with respect to tensile strength, compared with the sheets prepared from the compositions of Comparative Examples 1, 9, and 101.

Further, as is apparent from the results shown in Table B, the insulated wires prepared by employing the compositions of Examples 1 and 10 according to the present invention exhibited unexpectedly superior results in tensile strength and whitening, compared with the insulated wires prepared by employing the compositions of Comparative Examples 1, 9, and 101.

The whitening characteristics as mentioned in the above are the properties to be classified into physical properties of a product, such as a wire or a molded plug, as well as aesthetic features thereof. Please note that whitening phenomenon is influenced with flexibility of the product when being bent. If conspicuous whitening occurs to a product, such a product suffering conspicuous whitening may damage an insulating covering made of the resin composition, to cause a serious problem on insulating property of the covering.

In summary, in every test for each of the sheets and the insulated wires, the compositions of the present invention, in which all of the metal hydrate $Mg(OH)_2$, or a specific ratio as defined in the present invention of the metal hydrate $Mg(OH)_2$ was pretreated by a specific silane coupling agent having a vinyl group

or an epoxy group at its terminal, satisfied the criteria required and showed excellent performances. This is in contrast with the poor performances of the compositions of the comparative example, in which, as in Aida '781, all of the metal hydrate $Mg(OH)_2$ was pretreated by an aliphatic acid, or the metal hydrate $Mg(OH)_2$ was pretreated with such a silane coupling agent in a ratio but outside the range defined in the present invention.

It is believed that the distinct difference caused between the excellent properties as exhibited in Example 1 and the poor properties as shown in Comparative Example 1 is due to the difference of the surface-treatment (pretreatment) of the metal hydrate either by the specific silane coupling agent having a reactive group such as a vinyl group or an epoxy group at its terminal (in Example 1) or by the aliphatic acid not so reactive as the above silane coupling agent (in Comparative Example 1).

Further, in Comparative Example 9, in which, after the completion of the partial crosslinking reaction, the vinyl silane-treated magnesium hydroxide was added, the effect of improving mechanical properties of electric wires could not be obtained satisfactorily. It can be understood that the effect is not observed unless the metal hydrate is added before or at the same time with the partial crosslinking reaction.

The data already of record in the specification and the supplemental data submitted herewith demonstrate unexpectedly superior results of the claimed fire-retardant resin composition,

molded part, and method for processing fire-retardant resin composition over those of the cited prior art.

4. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: May 7, 2004

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